REMARKS/ARGUMENTS

Present Invention and Pending Claims

Claims 1-9 are currently pending. Claims 1-6 and 9 are directed to a resin composition, whereas claims 7 and 8 are directed to a laminate structure comprising the resin composition.

Summary of the Office Action

Claims 1-4, 7, and 8 stand rejected under 35 U.S.C. § 103(a), as allegedly obvious over Koyama et al. (U.S. Patent 5,153,038) in combination with Hu et al. (U.S. Patent 3,768,976). Claims 5, 6, and 9 stand rejected under 35 U.S.C. § 103(a), as allegedly obvious over Koyama et al. in combination with Hu et al. and Nippon Synthetic (JP 11049919A). Reconsideration of the pending claims is respectfully requested.

Discussion of the Obviousness Rejections

According to the Office Action, Koyama et al. allegedly discloses plastic containers comprising a barrier layer containing an oxygen scavenger and two outer layers of thermoplastic resin. The gas barrier resin can be a saponified ethylene-vinyl acetate copolymer (i.e., EVOH). The Office concedes that Koyama et al. does not disclose that the resin composition also comprises a substituted 9,10-anthraquinone. Hu et al. allegedly discloses the use of 9,10-anthraquinone-β-sodium sulfonate as a dye to indicate oxygen transfer through packaging material. The Examiner maintains that the cited references provide the proper motivation to combine their disclosures in the necessary manner to arrive at the present invention because (i) Koyama states that "[a]ll of oxygen scavengers customarily used in this field can be used" (col. 6, lines 1-3) and (ii) the oxygen scavengers of Hu et al. are "originally solid particles" (Office Action, bottom page 3).

In regards to the obviousness rejection of claims 5, 6, and 9, the Office acknowledges that Koyama et al. and Hu et al. fail to disclose the inclusion of an acid component and do not specify the water content of the EVOH. Nippon Synthetic reportedly discloses EVOH with small amounts of acid components and a water content up to 50%. In addition to the argument relating to claims 1-4, 7, and 8, the Office asserts that it would have been obvious

to combine and optimize the teachings of Nippon Synthetic to provide improved transparency, gas barrier properties, and film appearance.

The present invention is not obvious over the disclosures of the cited references because (a) there is no motivation for one of ordinary skill in the art to have combined the cited references, (b) even if combined, the cited references do not disclose all of the elements of the present invention as defined by the pending claims, and (c) the present invention exhibits unexpected properties in view of the disclosures of the cited references.

(a) No Motivation to Combine References

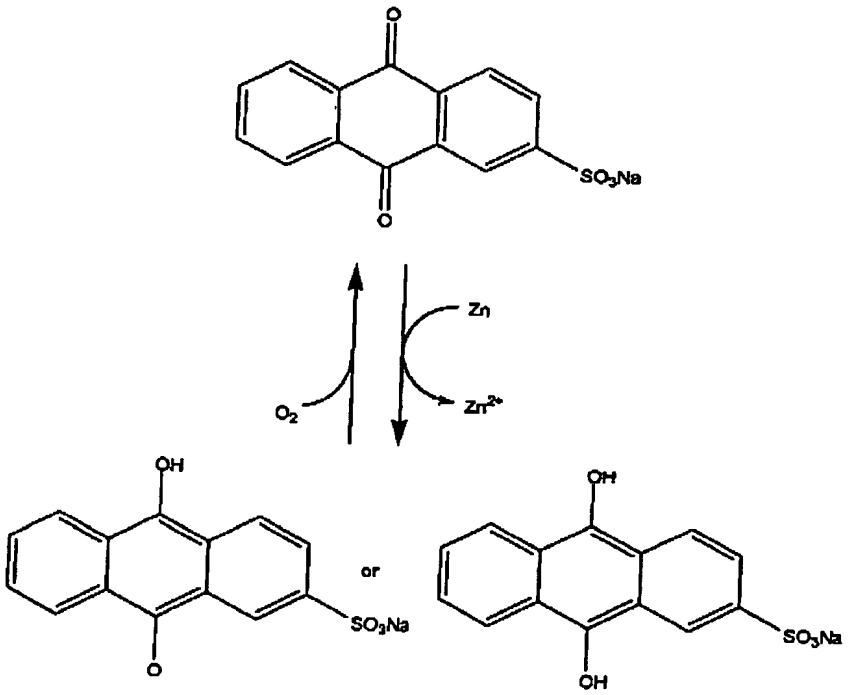
Koyama et al. discloses a plastic multilayer vessel with a gas barrier resin layer that contains an oxygen scavenger. EVOH is described as a suitable material for the gas barrier resin (see, e.g., col. 7, lines 17-32). As conceded by the Office, Koyama et al. does not disclose that the resin composition also comprises a substituted 9,10-anthraquinone. Even though Koyama et al. states that "[a]ll of oxygen scavengers customarily used in this field can be used" (col. 6, lines 1-3), the data disclosed below (with respect to the unexpected properties of the present invention) demonstrate different oxygen scavengers have different effects in the EVOH composition of the present invention.

Nippon Synthetic merely discloses an EVOH composition comprising EVOH, an alkali and/or alkaline earth metal acetate, acetic acid, phosphoric acid or an alkali metal hydrogen phosphate, and water. Nippon Synthetic does not teach or suggest a resin composition comprising a 9,10-substituted anthraquinone having a substituent at at least one of the 2-, 3-, 6- and 7-positions.

Hu et al. discloses a temperature-time integrating indicator comprising a transparent outer film pouch containing two transparent inner film pouches. Each of these inner film pouches is filled with an aqueous solution of a redox dye. Hu et al. states that 9,10-anthraquinone-β-sodium sulfonate is suitable as the redox dye (see, e.g., col. 2, lines 21-25, col. 3, lines 9-12, and Example 1).

An anthraquinone compound in itself does not have the ability to scavenge oxygen and can trap oxygen only when it is converted to a hydroquinone or a semiquinone derivative by reduction. The hydroquinone or semiquinone derivative returns to the

anthraquinone compound after trapping oxygen, i.e., reacting with oxygen. In the examples of Hu et al., an oxidation reaction of zinc ($Zn \rightarrow Zn^{2+}$), in the reaction of zinc with sodium hydroxide ($Zn + 2NaOH \rightarrow 2NaZnO_2 + H_2$), is used to reduce sodium anthraquinone-β-sulfonate (see the reaction scheme below).



The foregoing reaction can be applied to an aqueous solution of an anthraquinone, as in Hu et al., and but cannot be applied to an anthraquinone mixed with a resin (e.g., the gas barrier resin of Koyama et al.). Thus, after reading Hu et al., one of ordinary skill in the art would not be motivated to add the anthraquinone reduction system of Hu et al. to a gas barrier resin as an oxygen scavenger in the plastic multilayer vessel of Koyama et al.

In comparison, the EVOH composition of the present invention does not contain a material that acts as a reducing agent of anthraquinone. In the EVOH composition of the present invention, EVOH and anthraquinone are combined to enable anthraquinone to act as an oxygen scavenger. This combination and the benefits provided by this combination are not taught or suggested by Koyama et al., Hu et al., or Nippon Synthetic.

(b) Failure to Disclose All Claimed Elements

Koyama et al., Hu et al., and Nippon Synthetic fail to teach or suggest a substituted 9,10-anthraquinone having a substituent at at least one of the 2-, 3-, 6- and 7-positions and showing a percent weight loss when stood with heating at 250 °C for 60 minutes of not more than 5%, as recited in the pending claims.

(c) Unexpected Properties

The present invention is directed to a saponified ethylene-vinyl acetate copolymer (hereinafter "EVOH") composition and a multilayer structure thereof. The EVOH composition of the present invention comprises "a saponified ethylene-vinyl acetate copolymer (A) and a substituted 9,10-anthraquinone (B) having a substituent at at least one of the 2-, 3-, 6- and 7-positions and showing a percent weight loss when stood with heating at 250 °C for 60 minutes of not more than 5%." With this combination of features, in particular by adding the substituted anthraquinone, the present invention provides an EVOH composition that has superior oxygen barrier properties and appearance, is stable upon processing at high temperatures, and provides adhesion between layers.

When the percent weight loss of the substituted 9,10-anthraquinone when stood with heating exceeds 5%, the forming stability of the obtained EVOH composition at 250 °C decreases. Under such circumstances, it becomes difficult to obtain the desirable properties recited above for the inventive EVOH composition. More specifically, the superior characteristics of the inventive EVOH multilayer structure (e.g., oxygen barrier property and appearance, forming stability upon processing at high temperatures, and adhesion between layers) cannot be provided by the use of *any* (i.e., all) conventional oxygen scavengers (as alleged by the Examiner in the Office Action at page 3).

This fact is amply demonstrated by a consideration of the data recited in the present application. For example, reduced iron is used in Comparative Example 4 of the present specification, which is similar to the examples of Koyama et al. The measured properties of the obtained multilayer structure in Comparative Example 4 are poor in comparison to the measured properties of an EVOH multilayer structure of the present invention as reported in Example 1. The respective measured properties of the two structures are set

forth in Table 1 (at page 27) of the present application and are repeated below for the Examiner's convenience, where O is better than Δ which is better than X (see discussion at pages 23-24 of the present application).

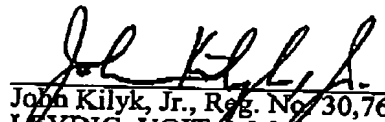
Example	Appearance	Forming Stability		Adhesion Between Layers (g/cm)	Resistance to Pinholes	Oxygen Barrier Property
		220 °C	250 °C			
Ex. 1	O	O	Δ	350	O	5 days
Comp. Ex. 4	X	Δ	Δ	60	X	4 days

Under the circumstances, the subject matter of claims 1-9 cannot properly be considered to be obvious in view of the disclosure of Koyama et al., Hu et al., and Nippon Synthetic. The obviousness rejection of the pending claims should be withdrawn.

Conclusion

Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,



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